

School services pattern in urban and rural areas: A comparatives study (Case study: Elementary school in Malang City and Malang Regency)

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Abstract. Availability of public facilities are important to support community needs and activities, such as educational facilities (school). Those facilities was needed to endorse the development program implementation which are conducted both of local and national government especially to boost the human resources qualities. This study aims to measures service rates of elementary school in the Malang City and Malang Regency based on supply aspect especially on availability of school unit and also configures the spatial pattern of the school services. Theses study conducted based on the disparity of facility services hypotheses especially on school service provision between urban and rural areas, which are Malang City considered as urban areas and Malang Regency as rural areas. According to the analysis results, rate of elementary school services in the Malang City defined by CGC method about 272% while in Malang the Regency are slightly higher at 319%. The pattern of school services in Malang City relatively similar between its districts, except Klojen District as the growth center of Malang City has the highest rate of services. Meanwhile in the Malang Regency has unique pattern which are high service rates located in the Kepanjen District areas as the growth center of Malang Regency and also several districts that located surrounding the Malang City areas which has impact of city developments. Another district has the lowest service rates due to physical limitations, such as those districts/villages located in the forest areas, coastal areas, or mountainous areas. It is means that students in Malang Regency can access elementary school freely as students in Malang City, they are not only can choose the school in their residential areas but also they can access school everywhere especially from their neighboring areas. It also noticed that there are significant differences of elementary school services between urban center areas and suburban or peripheral areas so that appropriate policy measures are needed to provide equal and balance of educational facilities development throughout each areas. The policy should be arranged appropriately especially in Malang Regency in accordance to the special characteristics of each areas in aims to promote adequate school services and reach all areas equally.

1. Introduction

Access to quality educational facilities considered as a barometer of the socioeconomic development and national development agenda [1]. In these decade, universal primary education development become as part of Millenium Development Goals (MDG's) [2]. However, many developing countries such as Indonesia, providing access to qualified education services are hampered the constraints in educational



supply such as education facilities and infrastructures against the quality and efficiency of education systems. In Indonesia, education sector development is the part of indicators national development agenda as it mandated on RPJMN 2015 – 2019. Therefore, in aim to enhance the education sector development there are several programs that can be done and also related to national program “*Wajib Belajar 9 Tahun*” which are qualified and competent teachers and lecturers recruitment, quality of education curriculum improvement and adequate education facilities (school) provision. Those programs are important to improve educational development in each area, and the important program is provision of educational facilities.

Up today, school provision was done based on basic demographical and physical characteristic aspect and it's still need comprehensive and adaptive plan in aim to identify the demand of new facilities based on existed service scales or rates of educational facilities (elementary schools). Research between the effects of competition on achievements and school performance on each area. Those attributes considered as part of facility services and become as important aspect that can increased the quality of services. Moreover, these study is aimed to update the method than can be used to measure the capacities, rates and patterns of education/school facility service in precision. Then those method used to identify areas that has not provided a maximal or optimal facility service and can be used to measure spatial connectivity between regions or areas based on educational facility services, for this research is elementary school.

As mentioned earlier, this research focused to measure educational facilities services especially at primary level that is elementary school which is in Malang City consist of general school and Islamic school. These facilities quite important, especially in supporting the realization of national development priority program in the education field “*Wajib Belajar 9 Tahun*” and currently the management and development of elementary schools are still on the authority of the city and regency government. Until now, there has been no policy on the development and arrangement of educational facility services, ranging from elementary to high school level, so there were competition or accumulation of service occurred related with this educational facilities while on the other hand students have limited choices in accessing the education facility properly especially when student want to choose school near they live. In the end, there is an imbalance or disparity of elementary or primary education services between urban and rural areas. In the Malang City as urban areas and Malang Regency as rural areas, problems related with the elementary school services need to get the best attention especially concentration of school in the certain part of the area. Based on the existing condition, there are areas that have many elementary school that are expected having a high level of services while there are another areas with low availability of elementary school. It is expected that the disparity of elementary school services will be higher in the rural areas than urban areas. Rural communities faced limited services than people in the city. The coverage of elementary school services is as broader as possible so that the capacity of services also expected to be substantial and this certainly affects the level of elementary school services.

2. Configuring the school services pattern

2.1. Literature Review

Several research showed that the school service as part of the school market identification. Garcia-Diaz et.al. (2016) study the relationship between urban school market concentration (lack of competition) and school technical efficiency. Similar with this research, neither efficiency nor competition is not directly observable. In order to measure school efficiency, the stochastic frontier analysis method (SFA) was used to calculate technical efficiency. In other research, Hoxby (2000) measure competition in a school market by using the Herfindahl–Hirschman market concentration index (HHI) as a proxy of the competition level every school market faces. The index employs the application of Geographical Information System (GIS) tools to incorporate the degree of competition each school faces from peer schools spatially located within a radius of 1 km in their local market area. These radius was considered and used in these research to identify the service coverage of elementary school. The consideration also contained on National Standard (SNI) especially to discover public facilities service coverage. Related

with service coverage, several authors (Barrow and Rouse, 2005; Millimet and Collier, 2008) delimited the school market or school service coverage based on the geographic zones and county sizes, while the others used the school district boundaries in metropolitan areas (Hoxby, 2000; Greene and Kang, 2004). Misra et al. (2012) pointed out that geographic delimitation is subject to an aggregation bias given that sometimes the real competition is not captured. In order to define different school market sizes, the authors drew circles around 1 km radius around each school.

2.2. Methods

These study was intended to compare the calculation method in aim to identify the service rates of facilities between basic/conventional method and the modification ones. Later method is referred as cell/grid based catchment method and it perceived has more accurate/precision result to calculate the service level of facility, especially for the educational facilities (schools) services [Setyono, 2015]. Basically, those method was derived from the Floating Catchment Method (FCM) [Luo, 2004]. The cell/grid based catchment method was applied with the help of GIS software through the buffer and overlay tools. In these research, those method are used to configure the service pattern of educational facility between urban areas (Malang City) and rural areas (Malang Regency). As national standard, the service layer/coverage for elementary school unit takes about 1,200 inhabitants or 1 kilometer radius [6]. The method used to identify the number of school service layers that could be catch in each units (villages and sub-districts) and it will be used as input for the calculation as follows:

$$\text{Rate of Services} = \frac{[\sum \text{Layer} * 2.400]}{\sum \text{Population}} \times 100\% \quad (1)$$

Moreover, spatial connectivity analysis was done based on the calculation result in order to find the pattern of elementary school services. Method that can be used to identify the spatial relationships between are in Malang City and Malang Regency related with school services is Moran Index 'I' [5]. Areas with a high index value indicates that the connectivity with the other areas are quite good, especially in terms of accessing elementary school services.

In this research, Malang City and Malang Regency was selected as study area. As it said before, this research focused on elementary school (*sekolah dasar & madrasah ibtidaiyah*) as one of main public facilities both for Malang City and Malang Regency in aim to provide qualified, adequate and equitable public education services. By 2015, there are 323 unit of elementary schools that are scattered in various regions in Malang City, in which 271 unit as general school and 52 unit as islamic school [7]. Meanwhile, there are 1.532 unit of elementary schools in Malang Regency consists 1.195 unit of general school and 337 unit of islamic school that are scattered on 33 districts. Development of elementary school will be spread in various part of Malang City and Malang Regency. Development of educational facilities are spread in various districts in Malang City and Malang Regency in order to provide adequate and qualified services to the entire areas and communities, as well in the study areas. Distribution of elementary school in each area/district is not too different in Malang City, contrast with the Malang Regency. In Malang City, each district has more than 60 unit of elementary school except Klojen District. Hence, elementary school number in Malang Regency's district ranging around 30 – 60 unit, except Kasembon and Kromengan District. Purwantoro village has the highest number of elementary school among other villages in Malang City, around 13 unit while the Kepanjen village become area in Malang Regency which highest number of elementary schools. From the distribution of those elementary school, the pattern and service coverages of school will be determined. Detail information of elementary school availability in Malang City and Malang Regency can be seen as follows.

Table 1. Elementary school availability in Malang City and Malang Regency

District	Number of Villages	Population Number	School Number		
			General School	Islamic School	Total
Malang City					
Kedungkandang	12	186.068	55	24	79
Sukun	11	190.053	57	12	69
Klojen	11	104.127	42	6	48
Blimbing	11	177.729	58	5	63
Lowokwaru	12	193.321	59	5	64
Total	57	851.298	271	52	323
Malang Regency					
Donomulyo	10	62.548	46	2	48
Kalipare	9	60.504	40	11	51
Pagak	8	45.757	30	6	36
Bantur	10	68.816	41	14	55
Gedangan	8	52.938	35	7	42
Sumbermanjing	15	90.350	50	15	65
Dampit	12	119.012	50	14	64
Tirtoyudo	13	60.737	38	4	42
Ampelgading	13	52.622	31	7	38
Poncokusumo	17	92.737	41	23	64
Wajak	13	80.825	40	16	56
Turen	15	114.108	54	18	72
Bululawang	14	71.147	23	19	42
Gondanglegi	14	84.577	32	24	56
Pagelaran	10	67.175	23	16	49
Kepanjen	18	106.668	48	6	54
Sumberpucung	7	53.642	34	2	36
Kromengan	7	38.222	22	2	24
Ngajum	9	49.094	30	7	37
Wonosari	8	41.292	30	3	33
Wagir	12	86.878	36	3	39
Pakisaji	12	88.030	36	6	42
Tajinan	12	53.743	21	15	36
Tumpang	15	75.440	35	14	49
Pakis	15	153.622	33	18	51
Jabung	15	73.850	35	9	44
Lawang	12	109.645	59	5	64
Singosari	17	178.534	60	13	73
Karangploso	9	81.986	25	9	34
Dau	10	74.953	28	2	30
Pujon	13	67.502	32	11	43
Ngantang	13	56.346	38	12	50
Kasembon	6	31.015	19	4	23
Total	390	2.544.315	1.195	337	1.532

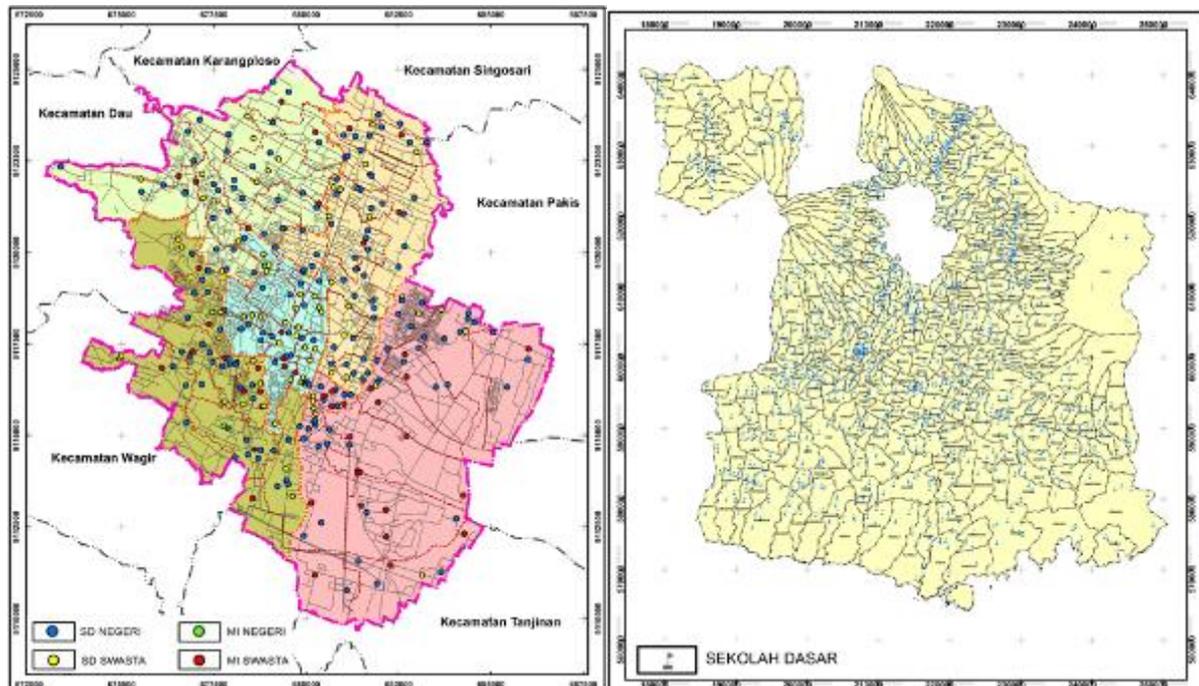


Figure 1. Elementary School Location (a) Malang City; (b) Malang Regency

3. Results

The initial phase in the formulation of the study results is to calculate the level of elementary school services based on the number of existing schools in each village (*desa*) and sub-districts (*kelurahan*) as the smallest administrative units in Malang City and Malang Regency. This calculation is based on the assumption that the communities or students are only able to access elementary schools within the scope of the administrative boundaries of their residential areas. According to the analysis results, it can be seen that the average rates of primary school services in Malang City is lower than the average service rates in Malang Regency which is 98.7% to 140.9% respectively. Those result illustrated that elementary schools in Malang City meet almost all the needs of community as normative standards while elementary school facilities in Malang Regency meet more than the needs of community standards. In the Malang City area, the average of elementary school services in each sub-district is relatively similar which ranged between 90-95%, except Kedungkandang District which has 119.3%. Then in Malang Regency area, almost all villages and sub-districts has a relatively high rate of elementary school services (more than 100%) except Poncokusumo District with only has 56%. Based on this calculation, it can be expected that the peoples and students in Malang City and Malang Regency can only choose elementary school on its local residential boundaries only. In general, the rate of elementary school services based solely on the number of existing schools is quite low compared with the results of other methods. Detailed results of this first/basic method can be seen as in figure 2.

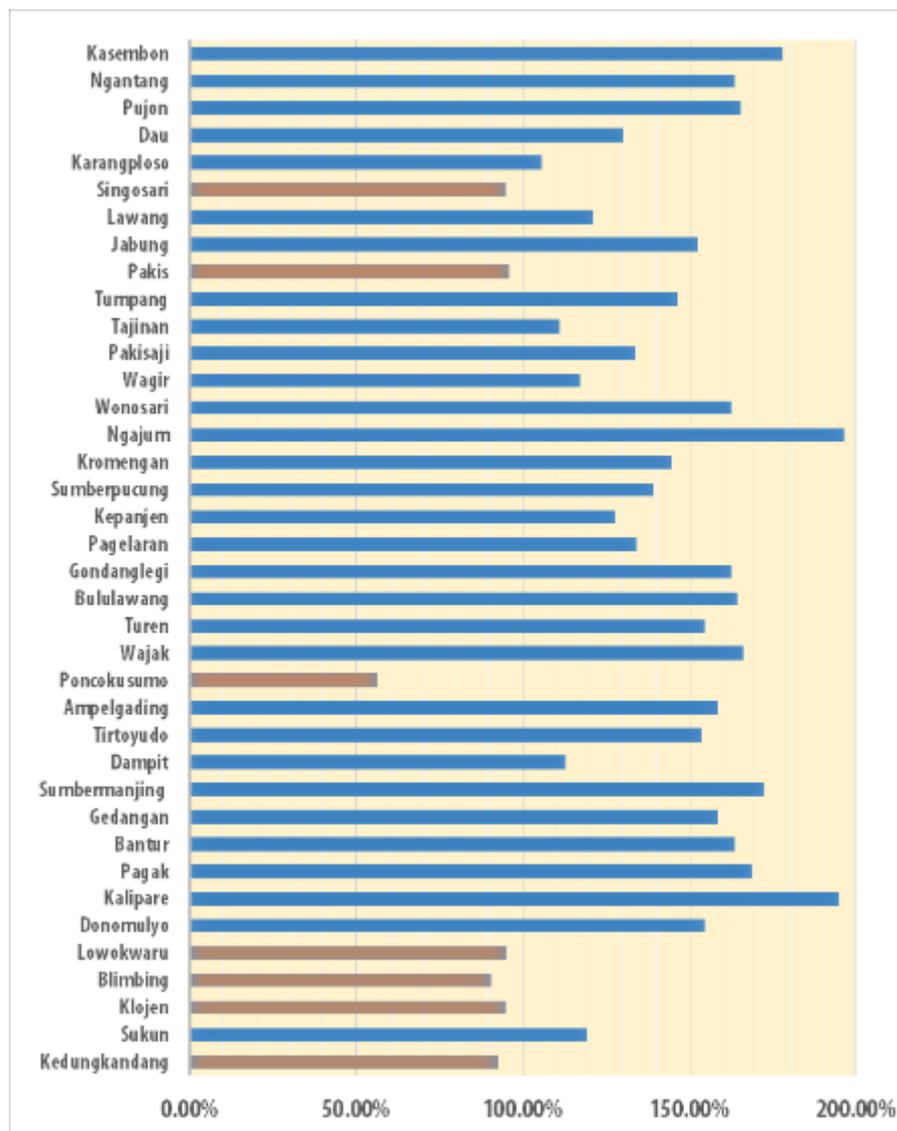


Figure 2. Rate of elementary school services in each district of Malang City & Malang Regency

Another step to determine the rate of elementary school services conducted by using the Administrative Boundary Catchment (ABC) method. As it has been explained, this method was used with the assumption that the communities or students can access not only the elementary school facilities within the scope of their residential areas but also the elementary schools in the neighboring areas while within the radius of elementary school service coverage which is 1 kilometer. These method was used to identify how many or number layers of elementary school services in each villages and sub-districts in Malang City and Malang Regency. Based on the analysis results, it can be seen that the pattern of elementary school (SD) services both in Malang City and Malang Regency showed a tendency rate of services are quite high, especially in urban or growth activity centers. In Malang City area, there are several sub-districts (*kelurahan*) served by more than 50 service layers of elementary school such as Kasin, Sukoharjo, Ciptomulyo, Kesatrian, Polehan and Bumiayu sub-district. Similarly, in the Malang Regency area, villages with more than 50 service layers of elementary school mostly located around the capital area (Kepanjen District), western areas and Malang City border areas such as Singosari, Lawang, Pakis, Dau, Karangploso and Pakisaji District. Those result indicates that the provision of elementary

school facilities still concentrated in the several growth center areas. The detailed analysis result of Administrative Boundary Catchment (ABC) method in Malang City and Malang Regency can be seen in the following picture (figure 3).

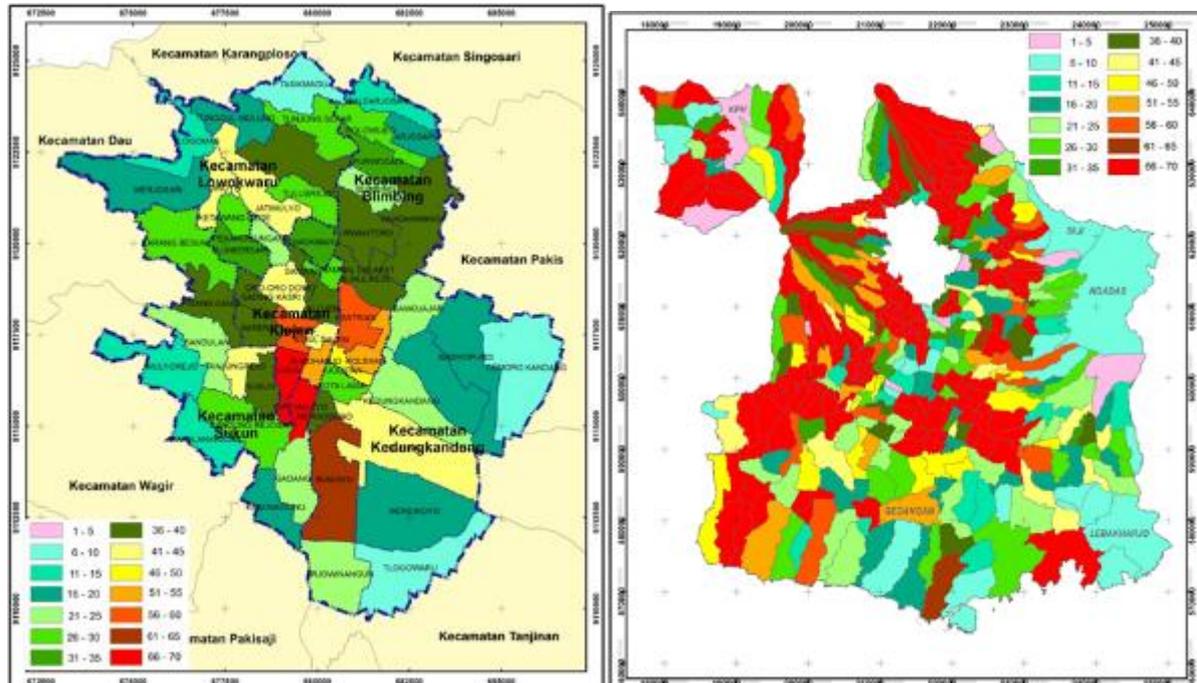


Figure 3. Service layer number based Administrative Boundary Catchment (ABC) method

Those number of school service layers that can be catch in each villages and sub-districts later used as main indicator to calculate the rate of services. Based on the calculation results, it can be obtained that the average rate of elementary school service in Malang City was much lower than the average rate in Malang Regency area which are 560,82% to 3.095,38% respectively. Klojen District became area in Malang City with average rate of elementary school service was more than 930%, while the other districts has average rates range around 400 – 500%. Meanwhile, almost all the districts in the Malang Regency has a high service rates which reaches around 1.000 – 2.500%. Based on those results, it can be estimated that the elementary school service rates in rural areas is much higher than in urban areas. It was also illustrated that elementary school facilities in Malang City were able to serve 4-5 times the population's needs in each district while elementary school facilities in Malang Regency have the higher service condition that reaches 10-25 times the needs of the existed population in these areas. In other words, students in Malang can choose 4-5 times more elementary school facilities surrounding their residential areas. However, the results was considered less good and precise because these method still did not consider the existing land use and conditions in the research areas, especially for non-built land were still included in the calculation of the rate of elementary school services in Malang City and Malang Regency. In general, the results from these method higher than the basic method results.

The last step done in these research was to determine the rate of elementary school services suing the Cell/Grid Based Catchment (CBC) method. Similar to the ABC method, it was used to identify and find the number service layers of elementary school can be catch in each analysis unit (villages & sub-districts). These method also used the assumption that the communities or students can access the primary school which is not only within their residential areas but also the facilities in the surrounding areas as long as it lies within the standard radius of elementary school service coverage of 1 kilometer. However the distinguish variables that made differences from the previous method was this method used the grid system and considered only built-up land use especially settlement areas so that the service rates assessed only in the urban functional areas. The result of Cell/Grid Based Catchment (CBC) analysis

showed that the average of elementary school service layers that can be catch in each sub district in Malang City was less than 40 layers. Sub-district that high number of elementary school services layers mostly located in the center areas of Malang City, such as Jodipan, Kotalama, Kidul Dalem, and Mergosono Sub-district. While in the sub-district on the Malang City periphery areas has smaller number of elementary school service layers which was ranged around 1 – 5 layers only. The similar condition can be seen from the calculation results of service rates in Malang Regency, whereas most of villages or sub-districts has access elementary school services around 1 – 5 layers. Meanwhile, there are some villages with high elementary school service layers between 16 – 20 layers, especially villages that are located between the main corridors to Malang City. Significant differences related with outcome of the CBC method are due to land use considerations that made most of the layer values in cell of unbuilt land are not considered in the calculation or analysis.

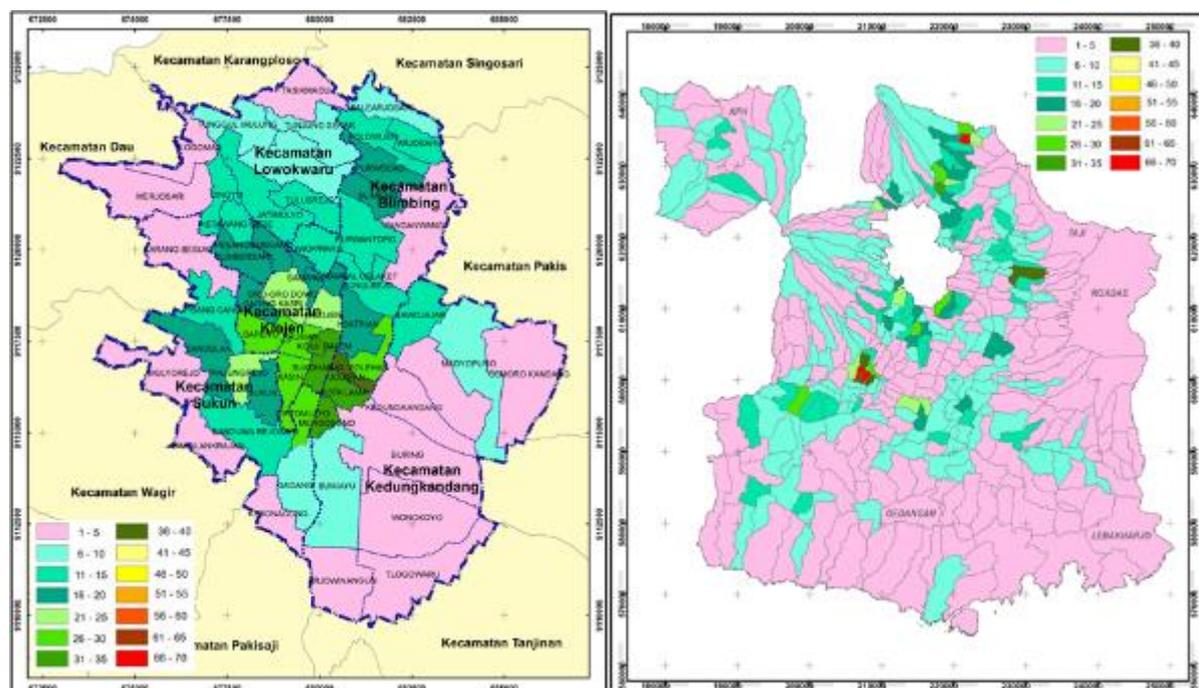


Figure 4. Service layer number based Cell/Grid Based Catchment (CGC) method

Based on the result of using the Cell/Grid Based Catchment (CBC) method, it is known that elementary school service rates has the significant result compared to the result of previous (ABC method). The rate of elementary school services in Malang City about 272% while the rate of elementary school services in Malang Regency are slightly higher at 319%. Related with rate of elementary school services of each district in Malang City, the average rate around 150 – 200%, except Klojen District which reached an average service rates about 569%. Based on the analysis results, it can be seen that there are sub-districts which did not have service rates up to 100% especially those located in suburban or peripheral areas of Malang City such as Pandanwangi, Arjowinangun, Lesanpuro, Merjosari, Tlogomas, Karangbesuki, Mulyorejo and Bakalankrajan sub-district. Then for the rate of elementary school services at the district level in Malang Regency has values with a fairly diverse range, but in general the average service rates around only 200 – 300%. The analysis results also showed that Kepanjen District become the area with the highest service rate reached 723%. Those illustrated that elementary school facilities in Kepanjen District and surrounding areas were able to serve 7 times the population's needs in related areas. All villages and sub-districts in Malang Regency have more than 100% elementary school service rates on averages, but it is noticed that there are villages with rate less than 100%. In general, the average result of the Cell/Grid Based Catchment (CBC) method lower than the Administrative Boundary Catchment (ABC) method but it did not mean poor results and could be

considered as a precise result because the consideration in the calculation of the analysis is more specific such as considered only built-up areas.

4. Conclusion

According to the study results, it can be illustrated that calculation using the Cell/Grid Based Catchment (CBC) method can be understood has more effective and accurate results to measure the rate of elementary school services up to now. Then related to the spatial aspect, it can be seen that the average rate of elementary school services in the Malang City are lower than in the Malang Regency. However, there is similar pattern of school services where the central areas or growth center in Malang City and Malang Regency become area with the highest rate of elementary school services compared to other areas which are Klojen District (Malang City) and Kepanjen District (Malang Regency). It can also be figured that there are significant differences of elementary school services between urban center areas and suburban or peripheral areas so that appropriate policy measures are needed to provide equal and balance of educational facilities development throughout each areas.

References

- [1] Mizunoya S, Zaw HT. Measuring the holes of the ship: Global cost estimations of internal inefficiency in primary education. *Int J of Ed Dev* 2017;54(1):8-17.
- [2] UNESCO (2015). Education for All 2000–2015: Achievements and Challenges. UNESCO Publishing, Paris, France. Retrieved from: <http://unesdoc.unesco.org/images/0023/002322/232205e.pdf>.
- [3] Garcia-Diaz R, del Castillo E, Cabral R. School competition and efficiency in elementary schools in Mexico. *Int J of Ed Dev* 2016;46(1):23-34.
- [4] Hoxby CM. Does competition among public schools benefit students and taxpayers? *Am. Econ. Rev.* 2000;90(5):1209–1238.
- [5] Millimet DL, Collier T. Efficiency in public schools: does competition matter? *J. Econometrics* 2008; 145 (1):134–157.
- [6] Misra K, Grimes PW, Rogers KE. Does competition improve public school efficiency? A spatial analysis. *Econ. Educ. Rev.* 2012;31 (6):1177–1190.
- [7] Puspitasari R, Susanto I. Spatial Analysis Cases of Dengue Fever in Sukoharjo Central Java Uses Moran Index. *Prosiding of Mathematic and Mathematic Education National Conference Yogyakarta* 2011.
- [8] Minister of National Education RI (2007). Minister of National Education RI Policy No. 24, 2007 about Facilities and Infrastructure of Elementary, Junior High Schools and Senior high School Standards. Republik Indonesia
- [9] National Indonesian Standard (SNI) 03-1733-2004: The Procedures for Planning a Residential Neighborhood in Urban Areas.